

ified; four hundred and sixty-three, or 12.70 per cent., were three-fourths verified; 2,761, or 75.73 per cent., were fully verified, so far as can be ascertained from the tri daily reports. The percentages for August will be published hereafter.

CAUTIONARY SIGNALS.

One hundred and forty-six cautionary signals were displayed during the month of September, 1882, of which one hundred and fifteen, or 78.77 per cent., were justified by winds of twenty-five miles per hour, at or within one hundred miles of the station. Fifty signals were changed from cautionary to off-shore; of these, thirty-seven, or 74 per cent., were fully justified; forty-five, or 90 per cent., were justified as to direction only, and thirty-nine, or 78 per cent., were justified as to velocity.

Seventy-nine winds of twenty-five miles or more per hour were reported, for which no signals were ordered; many of these were high local winds or strong sea-breezes.

NAVIGATION.

STAGE OF WATER IN RIVERS.

In the table on the right-hand of chart number iii. are given the highest and lowest stages of water observed at the Signal Service stations during the month of September, 1882. In the first column of this table are given the heights of water on the gauge which have been found dangerous to property at the stations.

The rivers have remained low during the month. In the Mississippi the highest water at the various stations from Saint Paul to New Orleans occurred between the 1st and 9th, except at Cairo and Memphis, where the highest stages were recorded on the 21st and 23d respectively.

In the Missouri the highest stages occurred on the 1st and 2d, and the lowest from the 24th to the close of the month.

The Tennessee river at Chattanooga was five feet and nine inches above low-water mark on the 1st, which is an unusually good boating stage for the season. During the twenty-four hours ending at 1:27 p. m., of the 13th, the river rose nine feet and nine inches; it remained stationary during the 14th, and fell rapidly on the 15th.

HIGH TIDES.

New Haven, Connecticut, 28th. Highest tide for many years; lumber yards flooded.

New York City, 26th. Very heavy sea; everything within its reach at Brighton Beach destroyed. The marine railroad between Brighton and Manhattan beaches was completely wrecked. The outer platform of the Brighton bathing pavilion was carried away, and other damage done. The high water continued on the 27th and 28th; many of the piers were covered, and at the ferry landings, the bridges were floated so high as to interfere with travel.

Ocean City, Maryland. Very high tides from 25th to 28th.

Cape Lookout, North Carolina, 10th. Very high tide, with tremendous sea-swell. 22d, highest sea-swell observed since August, 1879. High tides also occurred on the 24th and 26th.

Hatteras, North Carolina, 25th. Heavy sea running over the beach. 28th, the southern part of the island submerged.

Portsmouth, North Carolina. Very high tides from the 25th to 30th. On the 25th, the beach and island were submerged; on the 28th, the tide was the highest ever known.

Cedar Keys, Florida, 9th. A part of the town was inundated during the evening; lumber, etc., were floated into the streets. The water stood in the streets to a depth of four feet. The tide rose two feet higher than the high tide of 1873. The loss to property is estimated at \$100,000. The railroad will have to be rebuilt for a distance of four miles, a part of which (three-fourths of a mile) has entirely disappeared.

Port Eads, Louisiana, 9th: During the cyclone, the east side of the town was flooded by the rising of the water in bay, people were compelled to vacate their dwellings.

Punta Rassa, Florida, 9th.

Northport, Michigan, 14th: During the day, a sudden rise was observed in Traverse bay, about three miles south of station. The water rose from ten to fifteen feet above the ordinary level.

27th. Along the New Jersey coast, from Seabright to Monmouth Beach, the tide is reported to have been the highest known for the past forty years. At Bay View and Seaside, thousands of dollars worth of property was destroyed.

At Herbertstown and Summit, the bridges were lifted from their supports. At Swan creek, the docks and embankments were washed away. At Highland station the beach was cut out and the tracks of the New Jersey Southern railroad were covered with sand hills and all traffic was stopped.

High tides also occurred at Eastport, Maine, 29th, 30th; Smithville, North Carolina, 29th; Norfolk, Virginia, 26th; Little Egg Harbor, New Jersey, 26th; Charlestown, Massachusetts, 27th to 30th.

FLOODS.

The most destructive floods which have occurred during the month, were caused by the very heavy rains which fell along the Atlantic coast during the passage of low area iv.

Reports of the damage caused by these floods are given below:

Massachusetts: Springfield, 23d, a washout occurred on the Boston and Albany railroad, causing delay of trains. Many cellars were flooded. Greenfield, 23d, many culverts were washed away. The damage done in Franklin county is estimated at \$6,000. At North Adams, a bridge was carried away, and several mills were damaged. At Orange, the Miller river overflowed its banks, submerging considerable pasture lands. Trains were delayed owing to land-slides on railroads.

Rhode Island: Newport, 24th, on the Shore Line railroad, the heavy rains have caused washouts, delaying trains.

Connecticut: Hartford, 23d, the river rose at the rate of one foot per hour, from 7:00 to 11:00 a. m., being the most rapid rise since the great flood of 1854. A large area of meadow land north of the city is inundated; and a large quantity of logs were carried down the stream. New Haven, 23d, the streets were badly washed, and cellars flooded. The Naugatuck river overflowed its banks, carrying away some costly bridges that were being constructed near Waterbury.

New Jersey: Paterson, 24th, the streets along river were flooded, and many families forced to take refuge in the upper portions of their dwellings. The river rose twelve feet. Many bridges were washed away and others seriously undermined. At the mills on the Passaic river, operations have been suspended owing to damage caused by high water. At Rahway, the damage is estimated at \$500,000. The streets were flooded with water; eight bridges were washed away, and two others were undermined. Trains were stopped and all communication was cut off for many hours. One person was drowned, and several were injured.

In Bound Brook, on the 24th, the water flowed through the streets of the town, and covered the counters of the stores on Main street. Large quantities of valuable goods were ruined. At the woolen mills the water rose over the looms, causing a loss of about \$10,000. A bridge and a long stretch of the Lehigh valley railroad were washed away. The track of the New Jersey Central railroad was three feet under water, and at the station the water was two feet deep. The canal banks gave way in several places, and the canal lock, five miles below here, was destroyed. The water was two feet and eight inches higher than the flood of 1865.

At Newark the sewers were damaged, and fifteen feet of the Chatham street reservoir were swept away.

At Jersey City and Hoboken much damage was done. The fields were completely inundated, and in many cases the water covered the floors of the houses, causing people to vacate their homes. The reservoir of the Hackensack water-works was considerably damaged. A washout occurred on the New York and Western railroad. A number of sewers in various parts

of Jersey City were damaged to the extent of \$10,000. At Plainfield a substantial stone bridge over Green brook was washed away.

At Elizabeth, on the 23d, the water in the streets was knee-deep, flooding many of the houses. Barns and small buildings in some localities were floated away.

Moorestown: From the 21st to 24th, nearly all of the mill-dams in this vicinity were washed away; numerous and extensive washouts occurred on the railroad.

New York: New York City, 23d, six brick buildings in course of construction were undermined and fell, causing a loss of \$10,000. Many basements and cellars were flooded, causing great damage.

Sing Sing, 23d, washouts occurred along the railroad and travel was considerably delayed. The station was surrounded by water and many cellars were flooded.

Poughkeepsie, 23d, reports from the interior of the counties along the Hudson river state that roads were badly washed; the lowlands flooded and bridges were swept away.

Newburgh, 27th, many bridges have been swept away or damaged in this vicinity, and the new railroad station at this place was considerably damaged. Many cellars were flooded, causing much damage to merchandise.

At Cornwall, eight bridges were washed away, entailing a loss of \$12,000.

At Mountainville, a barn and dam were carried away, and a flour mill was damaged.

Port Jervis, 23d, trains have been delayed by washouts in the Ramapo valley; the tracks are submerged in places.

Pennsylvania: Philadelphia, 22d, damage to the extent of several thousand dollars has been done in and about the city; bridges, drains, and culverts were badly damaged. On the 23d, the Schuylkill river rose six feet. Much damage is reported to have been done at various points along the railroads. Reading, 23d, many cellars were flooded and the country roads are rendered impassable. Many hay-stacks have been swept away and some stock has been drowned. Newtown, 23d, several buildings were washed away and others were injured. Washouts occurred on the railroads in this vicinity.

Virginia: Fredericksburg, 23d, in Essex county four mills were washed away and great damage was done to crops and other property.

North Carolina: Tarboro', 22d, the heaviest rainstorm since 1842 occurred last night, sweeping away many bridges. The track of the Tarboro branch of the Wilmington and Weldon railroad was much damaged. Charlotte, 14th, serious washouts have occurred on the various railroads in this vicinity.

Texas: San Antonio, 6th, during a heavy rainstorm the streets were flooded. The San Antonio river rose eight feet, causing much damage to houses in the lower part of the city. The San Pedro creek, passing through the western part of the city, rose rapidly washing away all the bridges and houses on its banks. Several bridges were washed away on the International railroad and the track was much damaged.

Austin, 6th, Barons creek, south of this city has overflowed the farms on its banks, and fences and crops have been washed away. A flouring mill on the creek was destroyed, and another was badly damaged. The damage caused will amount to several thousand dollars.

TEMPERATURE OF WATER.

The temperature of water, as observed in rivers and harbors at the Signal Service stations, with the average depth at which observations were taken, is given in the table on the right-hand of chart number ii. In the first column of the table is given the maximum temperature observed during the month; and in the second column the minimum temperature observed during the same period.

The following table gives the highest and lowest temperatures of water at the several stations, with the range of water temperature, and the mean temperature of the air at the station, and the depth of water at which the observations were taken.

The greatest ranges occurred as follows: 22° at Provincetown; 18° at Chincoteague and Galveston; and 17.6° at Alpena. The smallest are: 2.07° at Eastport; 3° at San Francisco; 3.02° at Key West; and 5° at Marquette and Punta Rassa.

Temperature of Water for September, 1882.

STATION.	Temperature at bottom.		Range.	Average depth, feet and inches.	Mean temperature of the air at station.
	Max.	Min.			
	°	°	°	ft. in.	°
Atlantic City.....	73.9	68.0	5.9	6 10	69.1
Alpena.....	69.8	52.2	17.6	11 8	58.1
Augusta.....	83.5	68.5	15.0	9 10	74.6
Baltimore.....	78.0	68.0	10.0	10 1	69.0
Block Island.....	67.4	59.4	8.0	8 2	64.3
Boston.....	64.5	56.0	8.5	25 0	62.7
Buffalo.....	73.8	63.5	10.3	9 11	62.2
Burlington.....	73.3	60.0	13.3	17 0	60.1
Cedar Keys.....	87.0	80.0	7.0	10 6	79.2
Charleston.....	84.1	73.9	10.2	41 10	78.5
Chicago.....	72.8	62.8	10.0	8 2	65.0
Chincoteague.....	80.0	62.0	18.0	6 6	70.5
Cleveland.....	75.7	59.7	16.0	14 0	64.0
Detroit.....	74.0	62.0	12.0	24 3	64.2
Duluth.....	67.0	58.0	9.0	15 0	58.5
Delaware Breakwater.....	74.3	64.5	9.8	6 6	69.8
Eastport.....	60.4	47.7	12.7	16 3	56.0
Esanaba.....	66.0	61.8	4.2	15 0	63.2
Galveston.....	86.0	68.0	18.0	14 10	78.3
Grand Haven.....	71.5	57.0	14.5	19 0	62.2
Indianola.....	85.4	74.1	11.3	9 9	78.2
Jacksonville.....	87.0	79.0	8.0	15 0	77.8
Key West.....	87.0	83.8	3.2	16 3	82.2
Mackinac City.....	67.0	57.4	9.6	13 0	58.6
Marquette.....	61.8	56.8	5.0	10 6	56.9
Milwaukee.....	71.0	62.0	9.0	8 0	62.7
Mobile.....	81.5	77.0	4.5	15 0	75.7
New Haven.....	74.2	59.2	15.0	15 3	64.5
New London.....	69.0	61.0	8.0	12 6	64.8
Newport.....	68.9	59.7	9.2	10 1	64.6
New York.....	74.5	63.0	11.5	22 6	66.9
Norfolk.....	81.0	67.0	14.0	17 6	72.1
Pensacola.....	84.6	76.3	8.3	18 4	75.3
Portland, Me.....	60.0	63.5	3.5	20 1	61.7
Portland, Oreg.....	66.2	60.3	6.9	65 10	59.4
Port Eads.....	52.8	78.3	25.5	9 5	78.6
Provincetown.....	70.0	48.0	22.0	14 0	62.4
Punta Rassa.....	88.0	88.0	0.0	11 11	79.6
Sandusky.....	74.2	60.1	14.8	10 0	65.6
Sandy Hook.....	72.5	66.0	6.5	1 10	68.6
San Francisco.....	60.5	57.5	3.0	32 1	58.6
Savannah.....	82.8	73.4	9.4	13 5	77.1
Smithville.....	82.0	70.0	12.0	10 0	73.5
Toledo.....	73.5	63.5	10.0	11 8	64.2
Wilmington.....	81.5	71.5	10.0	13 0	74.0

*Observation not taken on 14th.

ATMOSPHERIC ELECTRICITY.

AURORAS.

Auroral displays were of frequent occurrence during September. The display on the evening of the 11th was the most important of the month, and was observed from the lower lake region westward to Dakota and southward to Virginia and southern Illinois. None of the displays noted were remarkable for their brilliancy or extent of observation. On the various dates they were reported as follows:

2d: Halifax, Nova Scotia.

3d: Duluth, Minnesota, faint auroral light from 9:15 to 9:25 p. m. Mackinac City, Michigan, pale auroral light at 9:00 p. m., lasting forty-five minutes.

4th: Deadwood, Dakota, faint auroral light, with occasional beams extending upward to an altitude of from 40° to 60°. It was first observed at 8:00 p. m., and disappeared at 11:00 p. m. Saint Vincent, Minnesota, faint auroral display from 10:00 p. m. to midnight. Marquette, Michigan, faint aurora from 9:10 to 9:40 p. m. Franklin, Wisconsin, faint auroral display from 9:00 to 10:00 p. m. Alpena, Michigan, aurora visible at 9:30 p. m., consisting of a diffuse light in the northern sky, with a few small streamers reaching an altitude of 60°. Cambridge, Massachusetts, distinct aurora observed at 10:15 p. m. Monticello, Iowa, aurora observed at 10:00 p. m. This display was also observed at the following Canadian stations: Toronto, Fredericton, and Halifax.

5th: Moorhead, Minnesota, faint aurora from 9:00 to 10:00 p. m. Franklin, Wisconsin, faint display from 9:00 to 10:00 p. m. Alpena, Michigan, diffuse auroral light with no streamers at 9:50 p. m. Rochester, aurora from 9:45 to 11:45 p. m., consisting of a few short faint beams shooting upward from a